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# Huddle-Sole Mobility Model in Mobile Adhoc Network

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***Abstract—The mobile adhoc network is highly dynamic and the nodes are mobile. It is a challenge to identify the mobile nodes' moving patterns and routing the packets along optimized routing paths according to the topology change in mobile adhoc networks. The research on Mobile Ad-hoc Network is drastically increased to achieve better performance and scalability. Node mobility is one of the important factors that affect the operation and performance of MANET routing protocols. In this paper, we propose Huddle-Sole mobility model that deals with the mobile nodes movement pattern as a group or individual node along the roads modeled in urban area. We examine the impact of huddle-sole mobility model on the routing protocols DYMO, DSDV and DSR and summarize results.***

***Keywords— Mobility model, DSDV, DSR, Routing, MANET***

## I. INTRODUCTION

Today's Internet is very fast and effective. Currently many network researchers are working on networks based on modern communication techniques, particularly wireless communications. Without the constraints of wired connections, wireless networks allow their hosts to roam. Mobile users can move around but still they are staying connected to the network. Notebook computer connectivity, Handheld personal computer connectivity, vehicle and ship networks are applications of this kind of network. We can deploy a wireless network quickly and easily. Such networks play vital role in both military and civilian systems [1].

A Mobile Ad Hoc Network (MANET) is a set of nodes which can communicate with each other using multi-hop wireless links. As the mobile nodes in MANETs dynamically establish routes to forward the data packets, MANET is called infrastructure-less networking. A node can directly communicate with only those nodes which are in its communication range [2]. The intermediate nodes which are in between the source node and the destination node forward messages to the nodes that are more than one hop distance from the source. Since the nodes are mobile, this network topology is ever changing [4]. Hence in Mobile Ad hoc networks, identifying the mobile nodes' movement pattern and finding the optimized paths through them is a challenging task [3].

This paper proposes Huddle-Sole mobility model that deals with the mobile nodes' movement pattern in cluster and individual along the roads in urban area and examines this mobility model using DSDV and DSR routing protocols.

The remaining sections are organized as follows. Section 2 presents the Huddle-Sole mobility model in MANET, section 3 analyzes the performance of DYMO, DSDV and DSR routing protocols in Huddle-Sole Mobility Model compared with the Freeway Mobility model and finally section 4 summarizes the paper.

## II. HUDDLE-SOLE MOBILITY MODEL

Huddle-Sole mobility model is a mobility model that deals with the movement patterns of individual nodes as well as group of nodes. Huddle-Sole mobility model is applicable in an urban area where people move by their own vehicles individually and as a group by public transport systems (bus, van). The setup is composed of vertical and horizontal streets. Hence in this model the movement pattern is categorized into two:

1. *Huddle mobility pattern*
2. *Sole mobility pattern*

When the nodes move, based on their velocity (speed and direction) they are clustered. This is called Huddle mobility pattern. When more than two nodes move with the same speed and in same direction (for example passengers in one bus, Group of family members or a company employees going in a van, escorts to VIPs), they are clustered into one group. The proposed model creates clusters using group similarity called traveling companions. Here the similarity is defined as group motion or group task. A huddle leader (HL) is selected based on the velocity and direction. Each node in the huddle is uniformly distributed in the neighborhood of the HL. Subsequently, every node has same speed and direction that is derived from that of the HL. The HL in the huddle acts as the local Domain Name Server for its group and also for neighbor groups or individuals. The HL broadcasts to its neighbor groups, neighbor individuals and the rest of the network about its presence, the nodes present in its group and domain information.

 

Sole mobility pattern deals with the individual node movement. For example, one person moving in his own vehicle. As an individual, in this model, the node may take either right or left or move forward or backward. Based on the probabilities of node movement patterns packets are routed from the source to destination.

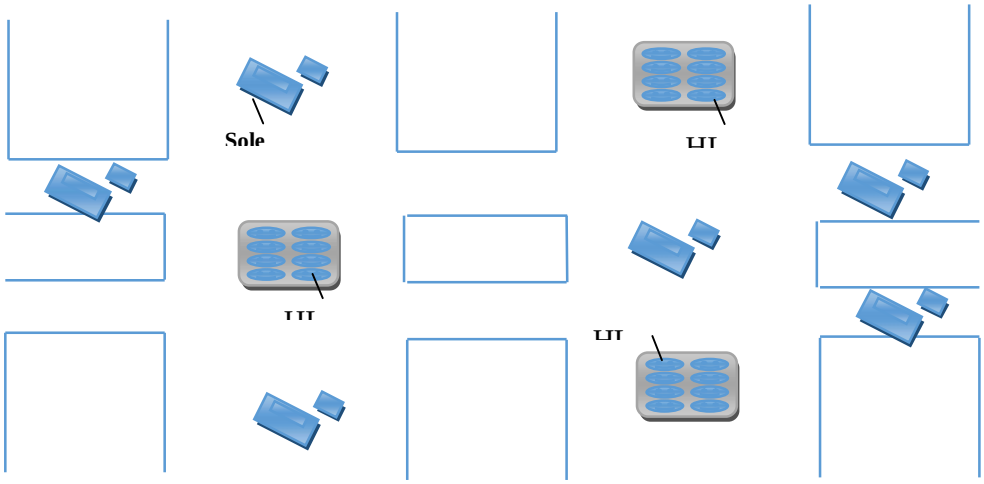


*Fig 1. Huddle-Sole Mobility Map*

Figure 1 illustrates the topography showing the movement of nodes in Huddle-Sole Mobility Model. The setup shows six individual mobile nodes and twenty four nodes clustered into three groups as they move in same direction with same speed. Each huddle consists of Node 1 as the huddle leader. This map shows the pathways along which the huddle or solo node can move. The map consists of a number of vertical and horizontal streets. The mobile nodes are allowed to move individually or in groups along the grid of vertical and horizontal roads on the map. At an intersection of a vertical and a horizontal road, the mobile node or a cluster may take left, right or go straight with certain probability. It imposes geographic limitations on node mobility.

## III. PERFORMANCE EVALUATION

In the Huddle-Sole mobility model, we have recorded the performance of DYMO, DSDV and DSR routing protocols by increasing the mobility. The simulation run for 500 secs with 10 UDP connections. Results were recorded for throughput (bytes/sec) with different speeds varying from 10 to 50 mtrs/sec. The performance results proves that as the mobility increases; the performance of DYMO, DSR and DSDV goes down. But in all the cases, DYMO performs better than DSDV and DSR.

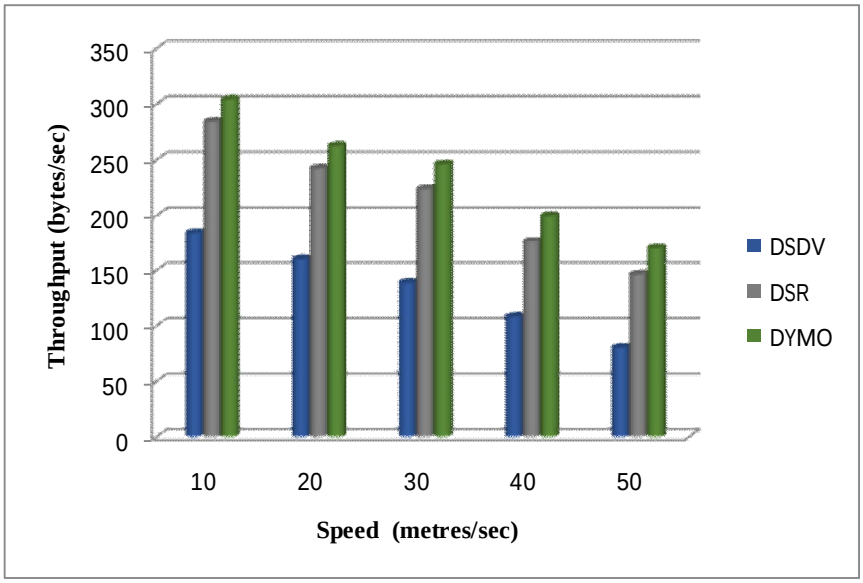


*Fig 2. Speed Vs Throughput in Freeway mobility model*

 

Figure 2 represents the performance of this setup with the Freeway mobility model and Figure 3 represents the performance of this setup in the Huddle-Sole Mobility model. Hence it suggests that we must focus on more stable mobility pattern rather seeking a shortest path in routing to reduce overheads.

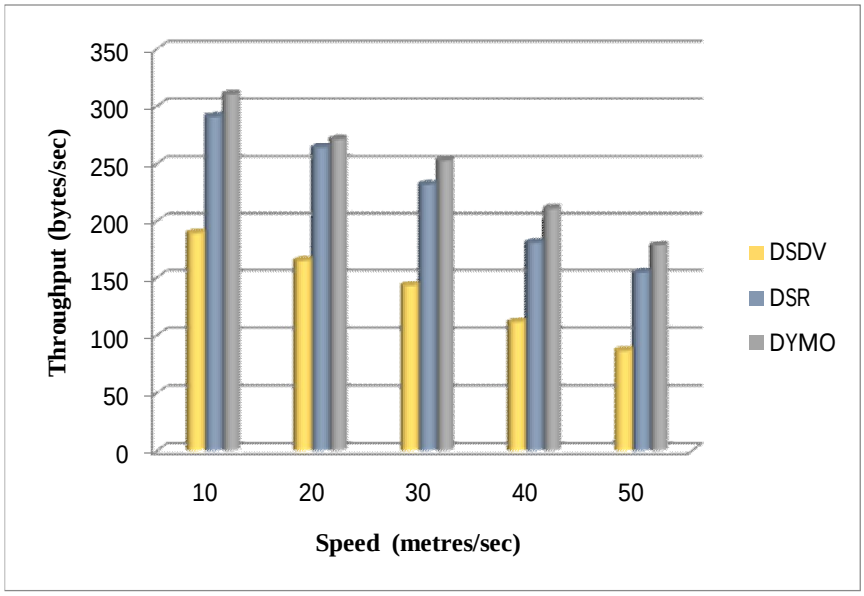


*Fig 3. Speed Vs Throughput in Huddle-Sole mobility model*

## IV. CONCLUSIONS

Node mobility is one of the important factors that affect the performance and operation of MANET routing protocols. This paper introduced Huddle-Sole mobility model that handled the mobile nodes movement pattern as a group or individual node along the roads modelled in urban area. We examined the impact of huddle-sole mobility model compared with the Freeway mobility model on the routing protocols DYMO, DSDV and DSR. But in all the cases, DYMO performed better than DSDV and DSR. This work suggests that as the mobility pattern gets the higher impact on routing in MANETs, we must focus on more stable mobility pattern rather seeking a shortest path in routing to reduce overheads. The Huddle-Sole mobility model performs well in urban areas.

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